DETAILED ACTION

Response to Arguments

1. Applicant's arguments with respect to claims 1-2, 4, 8-11, 13-16 and 18-25 have been considered but are moot in view of the new ground(s) of rejection.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1, 4, 8, 19 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Heinonen (US Patent#5896562) in view of Hayakawa (JP2001-292073) and Eckert et al. (US Patent#6745046).

Regarding claim 1, Heinonen teaches a circuit arrangement for use with a mobile telephone, the circuit arrangement comprising:

a transmitting circuit comprising:

a first signal line that corresponds to a first frequency band (DCS, TXC1 of Fig. 3);

a second signal line that corresponds to a second frequency band (GSM, TXC2 of Fig. 3);

a switch (380 of Fig. 3) that connects an antenna to one of the first and second signal lines;

a first amplifier (370 of Fig. 3) in series with the first signal line;

a second amplifier (390 of Fig. 3) in series with the second signal line;

a first band-pass filter (372 of Fig. 3) between the first amplifier and the switch, the first band-pass filter having a frequency range that corresponds to the first frequency band (column 6 lines 1-12); and

a second band-pass filter (392 of Fig. 3) between the second amplifier and the switch, the second band-pass filter having a frequency range that corresponds to the second frequency band (column 6 liens 13-28).

But, Heinonen does not expressly disclose a low temperature cofired ceramic (LTCC) module having integrated therein passive components for use in matching impedances between the switch and the first and second band-pass filters.

Hayakawa teaches using a multi-layer ceramic module having integrated therein passive components for use in matching impedances between the switch and the first and second band-pass filters (abstract, paragraphs 0016-0018, 0043, Figs. 1-3).

Eckert et al. teach a having a multimode transceiver implemented via LTCC technology directly in the corresponding ceramic multilayer substrate (column 3 lines 4-14, where shows particularly advantageous to transceiver and switching elements).

Note that it is also known in the art that LTCC is attractive for use in RF applications since low loss transmission line and high Q passive can be realized.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate integrated passive components for use in matching impedance between switch and filters taught by Hayakawa into the circuit arrangement of Heinonen with using LTCC technology for multilayer substrate implementation taught by Eckert et al., in order to provide cost-effective implementation and make stability to RF property with minimum reflections.

Regarding claim 4, Heinonen, Hayakawa, and Eckert et al. teach the limitation of claim 1. Hayakawa teaches further comprising sheet metal on which the first and second band-pass filters are mounted (Figs. 1-2, where a multilayer package provides sheet metal as common ground plane for filters to be mounted on).

Regarding claim 8, Heinonen, Hayakawa, and Eckert et al. teach the limitation of claim 1. Heinonen teaches the first and second band-pass filters have attenuation curves that can be brought into approximate alignment by shifting along a frequency axis (inherent since both filters are for transmitting portion with respect to different frequencies).

Regarding claim 19, Heinonen, Hayakawa, and Eckert et al. teach the limitation of claim 1. Eckert et al. teach wherein the switch is integrated in the LTCC module (column 3 lines 9-11).

Regarding claim 22, Heinonen, Hayakawa, and Eckert et al. teach the limitation of claim 1. Heinonen teaches a receiving circuit comprising: a third signal line that corresponds to a third frequency band (RXC1 or RXC2 of Fig. 3); and a third band-pass filter in series with the third signal line (column 7 lines 46-58).

3. Claims 2 and 24-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Heinonen (US Patent#5896562) in view of Hayakawa (JP2001-292073), Eckert et al. (US Patent#6745046), and Young (US Patent#6643522).

Regarding claim 2, Heinonen, Hayakawa, and Eckert et al. teach the limitation of claim 1.

But, Heinonen, Hayakawa, and Eckert et al. do not expressly disclose further comprising an isolator between the transmitting circuit and the receiving circuit.

Young teaches an isolator between the transmitting circuit and the receiving circuit (52 of Fig. 5, column 5 line 65 to column 6 line 3).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate isolator between transmitting circuit and receiving circuit taught by Young into the modified circuit arrangement of Heinonen, Hayakawa, and Eckert et al., in order prevent signal interference between transmitting circuit and receiving circuit.

Regarding claim 24, Heinonen, Hayakawa, Eckert et al., and Young teach the limitation of claim 2.

Heinonen, Hayakawa, Eckert et al., and Young teach wherein the isolator comprises part of the multi-layer ceramic module (Eckert et al. teach having switching elements in integration in column 3 lines 9-11; Hayakawa teaches switch being integrated as part of multi-layer ceramic module, Figs. 1-2 and paragraph 0043, obviously the isolator can be recognized as a switch element integrated into the multi-layer ceramic module).

Regarding claim 25, Heinonen, Hayakawa, Eckert et al., and Young teach the limitation of claim 2.

Young teach wherein the isolator comprise a circulator (52 of Fig. 5).

4. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Heinonen (US Patent#5896562) in view of Hayakawa (JP2001-292073), Eckert et al. (US Patent#6745046), and Weissman et al. (US2003/0050018).

Regarding claim 9, Heinonen, Hayakawa, and Eckert et al. teach the limitation of claim 1.

But, Heinonen, Hayakawa, and Eckert et al. do not expressly disclose the first and second amplifiers have amplifications of less than 26dB.

Weissman et al. teach the first and second amplifiers have amplifications of less than 26dB (paragraph 0020).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate amplifiers having amplifications of less than 26 dB taught by Weissman

et al. into the modified circuit arrangement of Heinonen, Hayakawa, and Eckert et al., in order to be suitable for application.

5. Claim 20 is rejected under 35 U.S.C. 103(a) as being unpatentable over Heinonen (US Patent#5896562) in view of Hayakawa (JP2001-292073), Eckert et al. (US Patent#6745046), and Hageltorn et al. (US Patent#6006117).

Regarding claim 20, Heinonen, Hayakawa, and Eckert et al. teach the limitation of claim 1.

But, Heinonen, Hayakawa, and Eckert et al. do not expressly disclose wherein the passive components comprise parts of a pi-filter.

Hageltorn et al. teach utilizing a pi-filter for impedance matching between an input impedance and an output impedance in a telecommunication device (column 5 lines 41-62, where key function of impedance matching filters is well-known to a man skilled in the art), which would have been obvious to one of ordinary skill in the art to recognize that the passive components of Hayakawa can be replaced with a pi-filter because they both perform impedance matching function equally well.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the passive components of Heinonen, Hayakawa, and Eckert et al. into a pi-filter for impedance matching taught by Hageltorn et al. by design preference.

6. Claims 15, 18 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Heinonen (US Patent#5896562) in view of Hayakawa (JP2001-292073), Eckert et al. (US Patent#6745046), and Newell et al. (US Patent#5815804).

Regarding claims 15, 18 and 21, Heinonen, Hayakawa, and Eckert et al. teach the limitations of claims 22 and 1.

But, Heinonen, Hayakawa, and Eckert et al. do not expressly disclose wherein the first and second band-pass filters comprise surface acoustic wave filters.

Newell et al. teach using surface wave filter in transceiver (column 5 lines 46-56).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate using surface wave filter taught by Newell et al. into the circuit arrangement of Heinonen, Hayakawa, and Eckert et al., in order to provide advantages in performance, cost, and size in manufacture of integrated circuit.

7. Claims 10, 13 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Heinonen (US Patent#5896562) in view of Hayakawa (JP2001-292073), Eckert et al. (US Patent#6745046), and Toda et al. (US Patent#6751471).

Regarding claim 10, Heinonen teaches circuitry comprising:

a transmitting portion (TXC1 and TXC2 of Fig. 3); and

a receiving portion (RXC1 and RXC2 of Fig. 3);

wherein the transmitting portion comprise plural signal lines, each of the plural signal lines for transmitting a signal in a different frequency band (TXC1 and TXC2 of Fig. 3, column

6 lines 1-12), each of the plural signal lines being in series with a switch (380 of Fig. 3), each of the plural signal lines comprising, in order, the switch for connecting an antenna (302 of Fig. 3) to one of the plural signal line, a band-pass filter (372 or 392 of Fig. 3);

wherein the receiving portion comprises a signal line for receiving a signal from an external device (RXC1 or RXC2 of Fig. 3), the signal line comprising a passive component (since no further detail is claimed, passive component is inherent as resistor, capacitor, or inductor in switch, filter, amplifier, etc.) and a band-pass filter (306 or 326 of Fig. 3).
But, Heinonen does not expressly disclose a passive component for use in matching impedance between the switch and a band-pass filter, wherein the transmitting portion comprises a low temperature cofired ceramic (LTCC) module having the passive component integrated therein; and having a single receiving line.

Hayakawa teaches using a multi-layer ceramic module having integrated therein passive components for use in matching impedances between the switch and the first and second band-pass filters (abstract, paragraphs 0016-0018, 0043, Figs. 1-3).

Eckert et al. teach a having a multimode transceiver implemented via LTCC technology directly in the corresponding ceramic multilayer substrate (column 3 lines 4-14, where shows particularly advantageous to transceiver and switching elements).

Note that it is also known in the art that LTCC is attractive for use in RF applications since low loss transmission line and high Q passive can be realized.

Toda et al. teach a receiving circuit comprising: a third signal line that corresponds to a third frequency band; and a third band-pass filter in series with the third signal line (401 of Fig. 14);

wherein the third signal line comprises an only signal transmission line in the receiving circuit for passing signals from an external device (receiving part of Fig. 14).

Note that transmitting circuit of Toda et al. was a combination of two transmitting lines (Fig. 3), which would have been obvious to one ordinary skill in the art to do the combine/separate modification on the transmitting circuit in term of application.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the receiving portion of Heinonen into having a single receiving line for dual band reception taught by Toda et al. and incorporate using integrated passive components for impedance matching taught by Hayakawa with using LTCC technology for multilayer substrate implementation, in order to provide cost-effective implementation and make stability to RF property with minimum cost and size in manufacture of integrated transceiver circuit.

Regarding claim 13, Heinonen, Hayakawa, Eckert et al., and Toda et al. teach the limitation of claim 10.

Eckert et al. teach wherein the switch, and passive components of the transmitting portion and the receiving portion comprise part of the LTCC module (column 3 lines 4-15).

Regarding claim 23, Heinonen, Hayakawa, and Eckert et al. teach the limitation of claim 22.

But, Heinonen, Hayakawa, and Eckert et al. do not expressly disclose wherein the third signal line comprises an only signal transmission line in the receiving circuit for passing signals from an external device.

Toda et al. teach a receiving circuit comprising: a third signal line that corresponds to a third frequency band; and a third band-pass filter in series with the third signal line (401 of Fig. 14); wherein the third signal line comprises an only signal transmission line in the receiving circuit for passing signals from an external device (receiving part of Fig. 14).

Note that transmitting circuit of Toda et al. was a combination of two transmitting lines (Fig. 3), which would have been obvious to one ordinary skill in the art to do the combine/separate modification on the transmitting circuit in term of application.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the circuit arrangement of Heinonen, Hayakawa, and Eckert et al. into having a single receiving line for dual frequency band reception taught by Toda et al., in order to reduce circuit size and cost.

8. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Heinonen (US Patent#5896562) in view of Hayakawa (JP2001-292073), Eckert et al. (US Patent#6745046), Toda et al. (US Patent6751471), and Young (US Patent#6643522).

Regarding claim 11, Heinonen, Hayakawa, Eckert et al., and Toda et al. teach the limitation of claim 10.

But, Heinonen, Hayakawa, Eckert et al., and Toda et al. do not expressly disclose further comprising an isolator between the transmitting portion and the receiving portion.

Young teaches an isolator between the transmitting circuit and the receiving circuit (52 of Fig. 5, column 5 line 65 to column 6 line 3).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate isolator between transmitting circuit and receiving circuit taught by Young into the modified circuit arrangement of Heinonen, Hayakawa, Eckert et al., and Toda et al., in order prevent signal interference between transmitting circuit and receiving circuit.

9. Claims 14 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Heinonen (US Patent#5896562) in view of Hayakawa (JP2001-292073), Eckert et al. (US Patent#6745046), Toda et al. (US Patent#6751471) and Newell et al. (US Patent#5815804).

Regarding claim 14, Heinonen, Hayakawa, Eckert et al., and Toda et al. teach the limitation of claim 10.

But, Heinonen, Hayakawa, Eckert et al., and Toda et al. do not expressly disclose wherein the switch comprise at least one of a field effect transistor, diodes, and mechanical components.

Newell et al. teach wherein the switch comprise at least one of a field effect transistor, diodes, and mechanical components (column 4 lines 46-50).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate using diode switch taught by Newell et al. into the circuitry of Heinonen, Hayakawa, Eckert et al., and Toda et al. by design preference.

Regarding claim 16, Heinonen, Hayakawa, Eckert et al., and Toda et al. teach the limitation of claim 23.

But, Heinonen, Hayakawa, Eckert et al., and Toda et al. do not expressly disclose wherein the first, second and third band-pass filters comprise surface acoustic wave filters.
Newell et al. teach using surface wave filter in transceiver (column 5 lines 46-56).
Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate using surface wave filter taught by Newell et al. into the circuit arrangement of Heinonen, Hayakawa, Eckert et al., and Toda et al., in order to provide advantages in performance, cost, and size in manufacture of integrated circuit.

Conclusion

10. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to ZHIYU LU whose telephone number is (571)272-2837. The examiner can normally be reached on Weekdays: 9AM-5PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nay Maung can be reached on (571) 272-7882. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Z. L./
Examiner, Art Unit 2618

/Nay A. Maung/
Supervisory Patent Examiner, Art Unit 2618

Zhiyu Lu
June 9, 2008